

The Discussion of Seismic Sedimentology

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Abstract: Seismic sedimentology is the subject that using seismic information to study sedimentary rocks and the formation process, it is a new frontier science, which is a new frontier of seismic stratigraphy and sequence stratigraphy. Seismic sedimentology the subject which is using seismic methods to study sedimentary rocks and the formation process, the research method mainly has 90 degrees of phase transition and formation slicing technology. 90 degree phase transformation makes seismic facies with lithology Stratigraphic Significance ; stratigraphic section is the plane distribution of the depositional system of the stratigraphic unit, which is used to study the stratigraphic units in each of the strata. In February 2005, the international conference held in the United States of Houston Seismic Sedimentology, following seismic stratigraphy and sequence stratigraphy, seismic sedimentology as a new subject has attracted more and more attention.

Keywords: Seismic sedimentology, lithology, sequence stratigraphy.

THE BASIC CONCEPT OF SEISMIC SEDIMENTOLOGY

Seismic sedimentology is a subject by using seismic data to study the sedimentary rocks and the formation process, the research method mainly has 90 degrees of phase transformation and formation slicing technology [1], Seismic sedimentology is a new discipline established in geophysics, sedimentology,

seismic stratigraphy and sequence stratigraphy and other disciplines. It is mainly based on the geological rules to use 3D seismic information and modern geophysical techniques to carry out the stratigraphic rocks, Study on the distribution of sedimentary system, sedimentary facies and sedimentary development. (Figure 1).

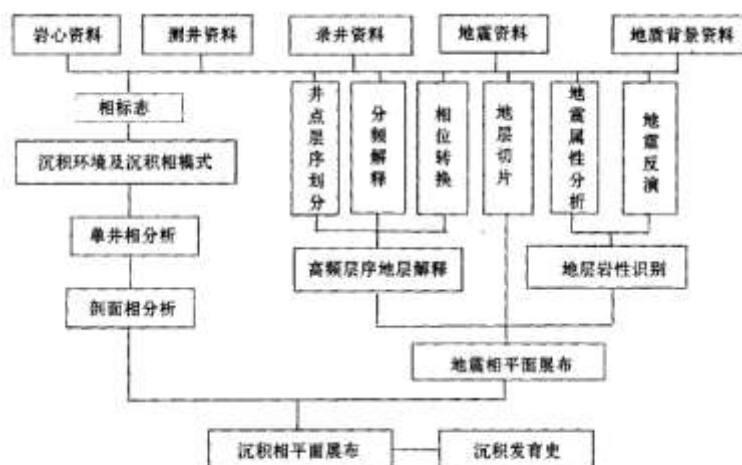


图 1 地震沉积学研究框图

Fig-1: Frame map of Seismic entology research

THE RESEARCH METHOD OF SEISMIC SEDIMENTOLOGY

Study on the technology of seismic sedimentology is still relatively limited, the key technology in the

study presented in seismic sedimentology mainly includes 90 degree phase conversion technology and stratal slicing etc.

90 phase shift technology

Seismic interpretation personnel usually require processing to provide zero phase seismic data [2], it has many advantages in seismic interpretation, including the symmetry of the wavelet, the maximum amplitude and the reflection interface, and the higher resolution, however, in the wave of zero phase seismic data in the trough corresponds to the formation interface, there is no good correspondence between the lithology formation and the seismic phase, it is very difficult to establish the relationship between seismic phase and lithology [3], especially in the case of thin layer development. The 90 phase conversion method is the center of the reflection wave amplitude when the seismic phase is rotated by 90 degrees, In order to overcome the shortcomings of zero phase waves. Seismic reflection waveform is symmetric with respect to the sand layer, but not with respect to the formation interface, this makes the seismic reflection phase axis to correspond with the lithologic stratigraphic and seismic phase also has the significance of the lithology [4], the seismic phase is only corresponding to the lithology in the thickness range of a wavelength. On the one hand, this method is more easy to explain when applied to real data [5]. On the other hand, the seismic channel is more consistent with the lithologic log.

Slice technology

Stratigraphic section is a display of seismic attributes in geological time, this technology is an important means of seismic sedimentology, Basic principle: Select two depositional surfaces as top and bottom surface in the establishment of the stratigraphic framework, Linear interpolation between the two interfaces with 1ms time interval, so we got a series of stratigraphic sections. Here is not talk about the operation process; this paper is based on the Recon module of Landmark software.

It is also a need to pay attention, geological conditions of the strata cannot be too complicated, the sedimentary environment of the entire formation should be the same and in a sedimentary cycle [6], the top and bottom interface must be in the seismic section of seismic section and the phase axis is not the same as the frequency of seismic events, this can avoid serious wear and guarantee the reliability of the effect of technology application, therefore, in the selection of the time interface, the best choice is to follow the wave crest of the automatic tracking mode to chase out of the same phase axis, try to ensure that the reference and so on when the seismic phase is basically the same, production process as shown in figure 2.

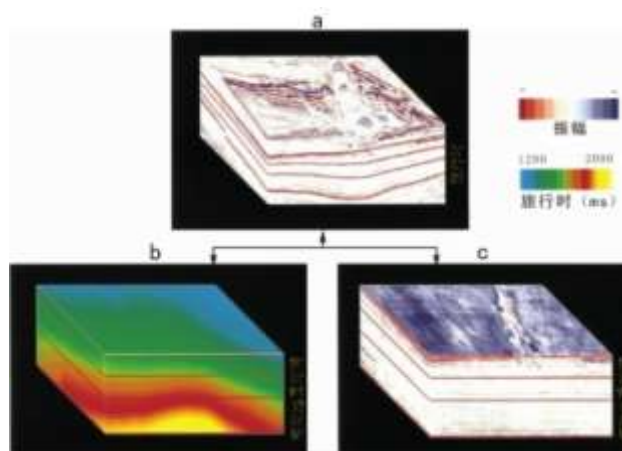


Fig. 2: production process

In the newly generated data body, the relative geological time represented by all the slices is consistent with the geological time of the real strata, the upper section is represented by the formation of the late formation, the lower section represents the formation of early formation, each layer is a stratigraphic interface, each slice represents the seismic response of the corresponding geological time interface, Such slices are more visually and more practical in geological sense.

Different requirements can be extracted from different attributes [7], they are in common with make

the complex data visualization, the researchers can analyze and judge the slices directly according to the change of image color, on a slice of "horizontal" observation can be judged the same geological period of the formation of sand shale percentage content; the "vertical" comparison of multiple slices is helpful to understand the sedimentary history of the strata, it can analyze the evolution of the same point in different geological periods, the change law of vertical upward reservoir can be analyzed by the corresponding to real strata; "Vertical and horizontal" combination can be intuitive to show the source direction, sand body distribution and the trend of the river, combine with

the geological background, logging interpretation and drilling data, this information can be classified as well as the reservoir prediction.

REFLECTIONS ON SEISMIC SEDIMENTOLOGY

The preamble has been told : Seismic sedimentology is subject that using of seismic methods to study sedimentary rocks and the formation process. As a matter of fact, the study of sedimentary rocks and its formation process is very extensive and thorough, it is not limited to the work of determining the lithology of the strata , also includes the development and evolution process of sediment formation, classification and characteristics of petrology and pore forming effect, Cheng Yan, development and evolution, sedimentary environment and facies study etc. [8], comprehensive description of lithology, sedimentary structure and structure, ancient biological markers, and geochemical signs, etc, and then integrated the use of the logo, guided by the sedimentary principle, make correct interpretation of the ancient sedimentary environment. Due to the limitations of seismic resolution and technical conditions, Seismic sedimentology can't use seismic means of sedimentary rocks and formed a comprehensive research process, the research content mainly involves seismic petrology, seismic geomorphology, sedimentary system and facies and sedimentary history research. With the continuous progress of the improvement of seismic resolution and geophysical technology, seismic sedimentology is likely to become a new subject after seismic stratigraphy and sequence stratigraphy of sedimentary rocks and their forming processes.

CONCLUSION AND COGNITION

Through the above analysis, we can get the following conclusions and understanding:

1. Seismic sedimentology by plane sedimentary stratigraphic units in seismic facies prediction method , this represents the future research direction. However, due to the limited resolution of seismic data and technical means, it can not be a comprehensive study of the sedimentary rocks and sedimentary processes, at present, the research mainly involves the use of seismic data in combination with well data to carry on the macro stratum, rock, sedimentary history and sedimentary system. In general, seismic sedimentology is still in its initial stage of development , With the improvement of seismic resolution and the progress of the geophysical technology , it is likely to become a new discipline in the study of sedimentary rocks and the formation of sedimentary rocks after seismic stratigraphy and sequence stratigraphy.
2. 90 degree phase conversion makes seismic phase has the significance of lithology, can be used to

explain the formation of high frequency sequences. but the conversion of phase conversion technology is not necessarily 90 , the conversion angle depends on the specific circumstances of the horizon calibration.

3. The strata slice is a slice method, which can be used to study the plane distribution of the depositional system in the same time. The slice method in the thickness ratio is more reasonable than the time slicing and the horizon slice , However, it neglects the variation of the deposition rate with time in the vertical direction, Therefore, and the stratigraphic section is not carried out in the strict sense of the time deposit.

REFERENCES

1. Zeng, H., & Backus, M. M. (2005). Interpretive advantages of 90-phase wavelets: Part 1—Modeling. *Geophysics*, 70(3), C7-C15.
2. Zeng, H., & Backus, M. M. (2005). Interpretive advantages of 90°-phase wavelets: Part 2—Seismic applications. *Geophysics*, 70(3), C17-C24.
3. Brown, A. R., Dahm, C. G., & Graebner, R. J. (1981). A stratigraphic case history using three-dimensional seismic data in the Gulf of Thailand. *Geophysical Prospecting*, 29(3), 327-349.
4. Schlager, W. (2000). The Future of Applied Sedimentary Geology: Perspectives. *Journal of Sedimentary Research*, 70(1).
5. Posamentier, H. W., Dorn, G. A., Cole, M. J., Beierle, C. W., & Ross, S. P. (1996, December). Imaging elements of depositional systems with 3-D seismic data: a case study. In *17th Annual Conference, SEPM Foundation, Gulf Coast Section* (pp. 213-228).
6. Zeng, H., Hentz, T. F., & Wood, L. J. (2001). Stratal slicing of Miocene-Pliocene sediments in Vermilion Block 50-Tiger Shoal Area, offshore Louisiana. *The Leading Edge*, 20(4), 408-418.
7. Zeng, H., Backus, M. M., Barrow, K. T., & Tyler, N. (1996). Facies mapping from three-dimensional seismic data: Potential and guidelines from a Tertiary sandstone-shale sequence model, Powderhorn field, Calhoun County, Texas. *AAPG bulletin*, 80(1), 16-45.
8. Zeng, H., Backus, M. M., Barrow, K. T., & Tyler, N. (1998). Stratal slicing, part I: realistic 3-D seismic model. *Geophysics*, 63(2), 502-513.